

He that will not reason is a bigot; he that cannot reason is a fool; and he that dares not reason is a slave.

William Drummond

We should take care not to make the intellect our god; it has, of course, powerful muscles, but no personality. It cannot lead; it can only serve.

Albert Einstein

I do not feel obliged to believe that the same God who has endowed us with sense, reason, and intellect has intended us to forgo their use.

Galileo Galilei

The further the spiritual evolution of mankind advances, the more certain it seems to me that the path to genuine religiosity does not lie through the fear of life, and the fear of death, and blind faith, but through striving after rational knowledge.

Albert Einstein

The reasonable man adapts himself to the world; the unreasonable man persists in trying to adapt the world to himself. Therefore all progress depends on the unreasonable man.

George Bernard Shaw

MAN IS A RATIONAL ANIMAL WHO ALWAYS LOSES HIS TEMPER WHEN HE IS CALLED UPON TO ACT IN ACCORDANCE WITH THE DICTATES OF REASON.

Oscar Wilde

Fantasy, abandoned by reason, produces impossible monsters; united with it, she is the mother of the arts and the origin of marvels.

Goya

If you want to make someone hate you, explain to them, logically and politely, why they are wrong.

J. Baylock

People generally quarrel because they cannot argue.

G. K. Chesterton

THE BEST WAY I KNOW OF TO WIN AN ARGUMENT IS TO START BY BEING IN THE RIGHT.

Lord Hailsham

Arguments are to be avoided: they are always vulgar and often convincing.

Oscar Wilde

Aims

By the end of this chapter you should:

- understand that the use of reason is a way to extend our knowledge from known facts
- be able to distinguish between inductive and deductive arguments – in both cases to evaluate the strengths and weaknesses of the arguments
- understand the premises/conclusion nature of an argument
- be very clear about the relationship between a valid argument and a true conclusion
- be aware of the need to be rigorous when using logic, the difficulties associated with choice of premises, the dangers of hidden assumptions and the problems with definitions
- be familiar with some elementary fallacies
- be able to apply these ideas to everyday examples
- appreciate that real-life problem solving requires imagination and creativity, and more than simple logic.

Introduction

There is a scene in a Broadway play where a guest at a party meets a Catholic priest. The guest asks, 'Don't you hear some terrible things in confession?' The priest replies, 'Oh yes. In fact when I was just starting out as a priest, the first person who came to me for confession told me they had committed a murder.' Later on in the play, a newcomer joins the party, and on being introduced to the priest says, 'I met you long ago Father. In fact I was the first person to come to you for confession.'

Aha! You immediately realised the connection here. The two pieces of information you had were combined to produce a third piece, and it seems as if we have generated new knowledge just by thinking about it! This seems rather useful; and what's more, it is certainly correct! If it is true that the first person who saw the priest for confession was a murderer, and that a particular person was the first person to see the priest for confession, then the conclusion that that particular person was a murderer is inescapable – we just use logic! Just as in maths, we seem to have hit upon a great method for getting new knowledge – all we need to do is apply our reasoning faculties. If this is true then we can forget all those messy science experiments... or is this beginning to sound too good to be true? Can we really get very far just using reason? If we think that we can then we are embracing what is called the **rationalist** approach – that we can ascertain truth by thinking and by the process of reflection alone.

We shall begin the chapter by considering a central part of the rationalist approach – the use of logic, its strengths, problems and pitfalls, and then consider other possible approaches that are needed to complement the logical analysis.

Deductive and inductive logic

Philosophers often make a distinction between two types of logic. **Deductive** logic involves examples like the one above, where, given the truth of some information, the conclusion must also be true. If the priest and the newcomer were telling the truth then the newcomer must be a murderer. Another very simple example might be:

A: All humans are mortal.

B: I am human.

therefore

C: I am mortal.

If statements A and B are true, then there can be no doubt that C is true. It would be ludicrous to assert A and B but deny C, and we can immediately see that this is as compelling a conclusion as we are likely to find. Of course, A and/or B may be false, but if they are true then there is no way that C can be false. So, if this is anything to go by, logic seems like it might play a prominent role in a search for reliable knowledge. Could certain knowledge be found by a study of precisely why these logical laws are so certain? Consider:

A: I am either a schnoodlepopper or a birshteinwaller, or both.

B: I am not a schnoodlepopper.

therefore

C: I am a birshteinwaller.

Once more, if A and B are true, then we are somehow compelled to accept C. Notice that it is the structure of the argument rather than the content that is important (what is a schnoodlepopper anyway?) and this means that deductive logic can be applied to any subject. When the initial statements (A, B, etc.) are more complex, applying logical analysis can be a very powerful tool.

- A** Make up some other absolutely convincing arguments.
- B** Make up some arguments which seem convincing, but in fact are not.

There is, however, another type of logic. **Inductive** logic does not involve certainty in the same way. The classic example involves the European naturalist observing European swans. He sees one swan – it is white. He sees another – it also is white. The third, fourth, fifth ... they are all white. After many years he has seen thousands of white swans, and he therefore says that the logical conclusion is that all swans are white. This is inductive logic. The naturalist has gone from several specific instances to a general conclusion. The question is, was he correct in doing so? We now know that there are black swans in Australia and New Zealand, so his conclusion was incorrect. The problem of generalising like this is called the 'problem of induction'.

It may seem that this is a million miles away from 'real-life' problems. (When do you ever hypothesise about the colours of animals?) But in fact, it is very common. If you think of the problem of induction as 'drawing general conclusions from specific examples', then you should see that we all do it all the time. A friend buys a car from a dealer, and it turns out to be a bad buy. On the basis of this one case, I will almost certainly not use the same car dealer! We all know that it takes a teacher to be unpleasant only a few times, or a student to miss a deadline a few times, before general conclusions are drawn. In both these cases, the conclusion may or may not be true, but it would be very hard to say that the conclusion is arrived at in an unreasonable way. It is not simply a matter of the number of times that something has happened. Think of the thousands of white swans! We need to realise that drawing general conclusions from specific examples is a very tricky business.

Depending on your approach, the fact that a developing child learns most of what she knows about the world in this manner is either reassuring (since it seems to work a lot of the time) or deeply disturbing (does that mean all our ideas are rather dubious?). In any case, the problem of induction is a very serious one for anyone looking for reliable knowledge.

The problem of induction

We all use induction all the time. I have always enjoyed going for a run, so I assume that when I run today I will enjoy that, too. Day has always followed night in my experience, so I assume that it will continue to do so. It might be suggested that this is just the way the world works – if something has happened often in the past, there is a good chance it will do so again. This is, it might seem, only reasonable. But consider the times you have seen someone on a lucky day, perhaps playing cards, or a sports person having a good day. People talk about 'being on a roll' or 'having a hot streak'. For that person, it seems that nothing can go wrong, and nobody wants to bet against them. Is this another valid application of induction?

Interestingly, the answer, certainly in sports, is a resounding 'no'. Careful research has shown that the idea of a lucky streak is an illusion. A basketball player has a one in five chance of shooting a basket, and she has just shot five in a row. Will she make her sixth shot? Is she 'on a roll'? It turns out that the probability is still one in five – or in other words, the 'past successes' have no bearing on 'future successes'. This is the problem of induction.

So why does the idea of the 'hot hand' still linger? Well, partly because when the player has shot five baskets in a row, one time in five she will shoot six! These freak occurrences will happen by the laws of probability (and when untold quantities of data are available to computers to look for freak occurrences, you can bet they will be reported every time). But more importantly, the idea of a 'hot hand' still lingers because humans have a great tendency to see what they want to see and to remember

selectively bits of data that stand out as significant (we shall see this again and again in different guises). Induction is about the human need to look for patterns in observations over time, but we need to be careful that our need to categorise and classify doesn't lead us to seeing what isn't really there.

Of course, we don't want to go too far down this road and reject all inductive reasoning; we want to be able to distinguish the good from the bad. Sometimes induction seems to work, and sometimes it doesn't. But how do we tell the difference?

- A What do we 'know' about the world by the process of induction?
- B Have you ever drawn an inductive conclusion and been surprised?
- C Identify some examples where inductive reasoning seems reasonable to you, and some where it seems unreasonable.

Consider the chicken who is fed every day by the farmer. Being a philosophical sort of chicken, after a few weeks it applies induction and comes out to greet the farmer each morning, expecting food. One day, the farmer wrings its neck. Bertrand Russell, the philosopher, remarked that perhaps '*more refined views as to the ... [problem of induction] ... would have been useful to the chicken*'.

- A How 'refined' are our views on induction?
- B What would the world be like if induction ceased to be reliable?
- C Are we going to have a shock one day if we rely on induction?
- D How can we justify the use of induction? Here are two possibilities:

'It has always worked before.'
'It is probably correct.'

Neither of these are good justifications, because they are **circular arguments**. What do you think this means?

Of course, in practice we often draw conclusions from limited evidence because we have no choice but to do so. Sometimes this seems reasonable (the sun has risen every day, so it will do so tomorrow), but sometimes not (shares have risen for the last few years, so they will always do so). In this exercise, we consider when evidence supports a conclusion and when it does not. In particular, we will see if we can find some general principles which might indicate when inductive logic is likely to be reliable and when it is likely to lead us astray.

- A An investor has purchased one hundred shares of oil stock every December for the last five years. In every case the value of the stock has appreciated every year by around 15 per cent, and it has paid dividends of about 8 per cent. This December she intends to buy another hundred shares of oil stock, reasoning that she will probably receive modest earnings while watching the value of the stock increase over the years.
In each of the following scenarios decide:
a) whether the additional fact makes the inductive conclusion more or less likely to be true
b) what principle governed your decision in the above.

- Suppose in the last five years she had always bought shares of one particular company, and she intends to purchase shares in the same company.
- Suppose that she had been buying oil stocks every December for fifteen years, not five.
- Suppose that oil stocks previously purchased had gone up by 30 per cent each year instead of by only 15 per cent.
- Suppose that her previous purchases of oil stock had been in six different companies, and that she intended to buy stock in a different, seventh one.
- Suppose she learnt that major oil-exporting countries have decided to meet every month instead of every six months.
- Suppose she discovers that tobacco stocks have just raised or lowered their dividend payments.

You should now have a set of principles to guide you in your use of inductive logic. Use them in this exercise.

- A Bill has taken four philosophy courses and has found them all extremely stimulating and worthwhile. He therefore signs up for another one, expecting it, too, to be worthwhile. On the basis of the principles you have just found, would the following statements, if true, make the conclusion more or less likely?
 - His previous philosophy courses were in ethics, science, logic and language.
 - The previous courses had all been taught by the same teacher, and the same teacher is scheduled to teach the present one.
 - Professor Abacus taught all the previous courses, but Professor Calculator is scheduled to teach the present one.
 - Bill found the previous philosophy courses to be the most exciting intellectual, personal and spiritual experiences of his entire life, and indeed were the only things that gave his life any meaning.
 - All previous courses met at 6.50p.m. on Tuesday, but the present one is scheduled for 6.50p.m. on Friday.
 - In addition to enjoying philosophy, Bill also enjoys anthropology, economics and political science.

More about deductive logic – arguments

Although we use induction all the time, it seems that if it is certainty we are seeking then we ought to stick with deduction. The examples in the introduction to this chapter showed clearly that deduction allows us to deduce a conclusion with **absolute certainty**. That is, if I am human and if all humans are mortal then it is absolutely certain that I am mortal. It is difficult to say, absolutely precisely, why the conclusion is so compelling, but it is. In this case, the logic of the situation strikes us with some force – which is a very promising start!

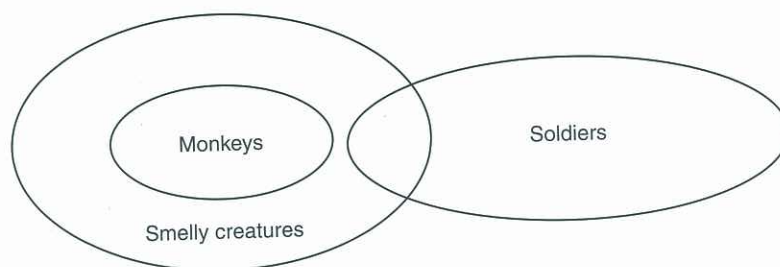
Here are a couple of more painful examples. In the following two cases, suppose that A and B are true. Must C also be true?

- 1 A: No monkeys are soldiers.
B: All monkeys are smelly.
C: Some smelly creatures aren't soldiers.

- 2 A: No emperors are dentists.
 B: All children fear dentists.
 C: No children fear emperors.

These are examples where it's quite hard to get your head around the relationships between the monkeys and the soldiers, and the emperors and the children. Whatever you think about the conclusion, it is clearly less obvious than in simpler examples. Perhaps this is the first problem of rationalism – applying logic can be difficult just because it is!

A useful tool for considering these types of problems is the Venn diagram. Imagine all the things in the problems to be in sets. So for question 1 above, we have the sets of monkeys, soldiers and smelly things. We represent these as three overlapping ovals:



Think carefully about how to arrange the ovals in these diagrams – there is one little problem here, can you see it? Once you have drawn the diagram, you should be able to see that the argument is valid. Try drawing Venn diagrams for the question below.

A Identify the valid and invalid arguments here, using Venn diagrams if you like.

- 1 If my house is bombed it will be reduced to rubble.
 My house is not bombed.
 therefore: My house will not be reduced to rubble.
- 2 If my house is bombed it will be reduced to rubble.
 My house is reduced to rubble.
 therefore: My house must have been bombed.
- 3 If my house is bombed it will be reduced to rubble.
 My house is not reduced to rubble.
 therefore: My house cannot have been bombed.
- 4 All monetarists control the money supply.
 Margaret Thatcher controlled the money supply.
 therefore: Margaret Thatcher was a monetarist.
- 5 All accountants are tennis players.
 All youngsters are tennis players.
 therefore: All accountants are youngsters.
- 6 All poets are imaginative.
 No poets have business acumen.
 therefore: No one with good business acumen is imaginative.
- 7 All Buddhists are vegetarians.
 Peter is a vegetarian.
 therefore: Peter is a Buddhist.

- 8 Some Muslims don't drink alcohol.
 All Arabs are Muslims.
 therefore: Some Arabs don't drink alcohol.
- 9 All women are either singers or criminals (but not both).
 All women in jail are criminals.
 therefore: No woman in jail is a singer.
- 10 All of my Theory of Knowledge students are male dwarves.
 No dwarf can resist giving his teacher large gifts.
 therefore: All of my Theory of Knowledge students will give me large gifts.

More about deductive logic – truth and validity

You have probably noticed that so far we have been a little careless with our terms in discussing the use of deduction. We need to make a vital distinction in what we are doing. Consider the following argument:

- A: All students are lazy.
 B: I am a student.
 therefore C: I am lazy.

You can see that this is a perfectly **valid** logical argument. If A and B are true then C must be true. However the **conclusion** is obviously dubious because at least one of the **premises** of the argument (A or B) is incorrect (that is, it is not true that all students are lazy). There are two completely separate issues here – the truth of the premises themselves and the correctness of the method used to draw a conclusion from the premises (the logical argument). This is an extremely important point. For the conclusion of a logical argument to be true, the logic must be correct *and* the premises must be true. If you want to undermine an argument, you can try to fault the logic or you can dispute the premises of the argument.

We can summarise this in the following table:

Validity of logic	Truth of premises	
	True	False
	Valid	Invalid
	Conclusion must be T	Conclusion may be T or F
	Conclusion may be T or F	Conclusion may be T or F

A Here are some arguments. Decide whether the premises are true or false, whether the logic is valid or invalid and hence whether or not the conclusion must be true.

- 1 All Australian cities are in the southern hemisphere.
 Sydney is not an Australian city.
 therefore: Sydney is not in the southern hemisphere.
- 2 All Australian states are in the southern hemisphere.
 Queensland is an Australian state.
 therefore: Queensland is in the southern hemisphere.

- 3 All American states have beaches.
Hawaii is an American state.
therefore: Hawaii has beaches.
- 4 All politicians are exceptionally honest people.
I am a politician.
therefore: I am an exceptionally honest person.
- 5 Most people in England speak English.
Most people in New Zealand speak English.
therefore: Most people in China speak English. (What sort of logic is this?)

B Make up an argument for each of the categories in the table above.

The importance of premises

The last section alerts us to a crucial problem about knowledge – that the validity of the logic is one thing, but the truth of the conclusion is something entirely different. If the truth of the conclusion depends on the truth of the premises, then we need to take a close look at what we use as premises.

To make the point here we shall try to apply logic to a set of facts (given in story form) to test the truth of certain conclusions.

A First, read the story below.

The dangers of crossing the road

The old lady had just finished her shopping and was starting to cross the road when a car sped around the corner. The cyclist, fearing an accident, shouted 'Watch out', and the car driver slammed on the brakes – but it was too late. A collision was unavoidable. Shopping bags were scattered all over the road, but fortunately no one was seriously injured.

The police appeared soon afterwards and interviewed all the relevant witnesses. The lady's poor vision had contributed to the accident and the car had been speeding.

Look at the statements below:

- If the statement is definitely true (based on **only the information in the story**) mark 'T'.
- If the statement is definitely false (based on **only the information in the story**) mark 'F'.
- If there is not enough information, and you cannot decide, then mark '?'.

There is, however, one catch. Once you have answered a question, **you should not go back and change any of your earlier answers**. Doing so will invalidate the exercise.

- 1 There was a car travelling faster than the speed limit.
- 2 The old lady in the story had been shopping.
- 3 A vehicle came round the corner just after a lady had stepped off the pavement.
- 4 The car driver was unable to avoid a collision.
- 5 The police came to investigate the incident.
- 6 Although the old lady was struck by the car, she was not seriously injured.
- 7 Shopping was scattered over the road.

- 8 The driver slammed on his brakes.
- 9 The police interviewed the car driver.
- 10 The old lady had poor eyesight.
- 11 The car's speeding contributed to the accident.
- 12 The old lady was riding a bicycle.
- 13 The cyclist was seriously injured.
- 14 There was at least one car driver involved in the accident.
- 15 The lady crossed the road near a corner.

B Now follow the same procedure for the story and set of statements below.

Incident in the store

The old man had just turned off the lights in the store and was preparing to lock up and go home when a youth appeared and demanded money. The owner opened the cash register; the contents were grabbed, and the man ran away. The police were informed immediately.

- 1 A young man appeared after the lights had been turned off.
- 2 The old man was preparing to go home.
- 3 The robber demanded money.
- 4 Someone opened the cash register.
- 5 The robber demanded money from the owner.
- 6 The person who opened the cash register was a man.
- 7 The cash register contained money, but we are not told how much money.
- 8 The gender of the owner was not revealed in the story.
- 9 The robber did not demand money.
- 10 After the man grabbed the contents of the cash register, he ran away.
- 11 The young man appeared after the lights had been turned off.
- 12 The robber was a man.
- 13 The owner was a man.
- 14 The owner appeared and demanded money.
- 15 The man ran away after he had demanded money.

C Go back and look again. The majority of your answers should be '?'. What do you learn from these stories?

D Make up a situation, like the two stories above, where the reader naturally makes all sorts of assumptions.

In the cases above, few people manage to follow the instructions remotely accurately. You should discuss these stories and see exactly what you assumed and why the stories are so easy to misinterpret. As a matter of fact, it seems that humans find it very difficult indeed to make deductions strictly on the basis of evidence. Instead, we seem to tell ourselves a story, to make assumptions and to embroider events according to our own personal prejudices. The full story here will have to wait until Chapter 11 – for now we should note merely that strict deduction is very difficult to achieve!

Logic in the real world: arguments, axioms and assumptions

We now turn to examining the use of reason in everyday life. For example, consider the following:

If inflation is allowed to continue, the unions will demand a steep rise in wages. And that is what is going to happen, because inflation is going to be allowed to continue.

To see if this is a valid logical argument, we can rewrite it as:

Premise 1: Inflation will imply wage rises.

Premise 2: There will be inflation.

Conclusion: There will be wage rises.

Hopefully, you can now see that this is a valid argument. That is, if the premises are true then the conclusion will also be true. In this case, we can't really be sure about the truth of the premises, although an economist might be inclined to agree with the first one in general terms.

A Evaluate the logic in the following arguments.

- 1 The alternatives seem to be that either the US government weakens its NATO commitment by withdrawing troops from Europe or that it meets increasing criticism at home for the enormous funds spent in maintaining these troops abroad. The government will never weaken its NATO commitment, so we can expect criticism to increase.
- 2 The streets are no safer today than they were five years ago, yet if the Crime Control Act was effective we would expect the streets to be safer. Hence the act was not effective.
- 3 Granted, if there were no problems on Earth, humankind should explore the moon. But there are plenty of problems on Earth, so we should not be spending money to explore the moon.
- 4 Maybe the President did accept bribes from business interests to pass certain laws. On the other hand, these might be vicious rumours spread by his political enemies. This I cannot believe, so I conclude that the President did accept the bribes.
- 5 By 2008, either we will institute far-reaching procedures to recycle our waste, or by then we will have to find room for 900 million tons of waste paper, plastic and other junk produced by our affluent society. However, we believe that somehow such room will be found. Hence there will be no need for large-scale recycling.
- 6 If the French tend to eat, drink and smoke more than people in other European countries then we might expect their life expectancy to be lower than people in, say, Great Britain or Italy, and this is exactly what we find. French men live for an average of 67.1 years and French women for 70.2 years, as opposed to the European male average of 70.3 years and female average of 74.3 years. Hence the French must eat, drink and smoke too much.

B Now that you have had a look at the sorts of problems we encounter in 'real-world' logic, we can try something a little more involved. In questions 7–10 below, all the arguments are valid; they are good deductive logic. But they arrive at opposite conclusions. Examine each one and decide which argument in each pair you find most compelling.

- 7 • Welfare systems discourage people from working. Having lots of people unemployed is bad for the economy. Therefore, if we want a healthy economy we should look for ways to abandon the welfare system.
- The more very poor people you have in a generally rich country, the higher the crime rate. A high level of welfare stops people from being very poor, so to keep crime low we should maintain this high level of welfare.
- 8 • Minorities suffer from increasing racism in a certain country. An increase of foreigners will lead, in practice, to more people suffering from racism. Therefore existing minorities are actually helped by tough immigration laws.
- Minorities suffer from increasing racism in a certain country. An increase of foreigners will, over time, lead to greater acceptance of all minorities. Therefore existing minorities are disadvantaged by tough immigration laws.
- 9 • Killing someone, unless in self-defence, is wrong. Abortion kills unborn babies. Therefore abortion is wrong.
- What happens to a person's body is ultimately their decision. To prevent a person deciding about their own body is wrong. Having an abortion involves a woman deciding about her body, so to prevent her doing that would be wrong. Hence preventing abortion is wrong.
- 10 • A race that places itself above all others is despicable. Humans place themselves above all other animals. Therefore humans are despicable.
- A race that did not place itself above all others would not have survived for very long. Hence placing one's race above all others is a natural survival trait. Hence it is perfectly acceptable to place one's race above all others.

Questions 7–10 reinforce the crucial distinction between validity and truth. In particular, it is interesting to see that **logic is of no help in choosing between arguments**. This is perhaps rather surprising, especially since we were hoping to use reason as a tool in our search for truth and certainty. It seems not to be living up to our initial hopes.

C Our final set of exercises illustrates once more the problem of choosing correct premises. In each of the following arguments, there is an unstated assumption required to make the argument valid. Identify that assumption.

- 11 Property prices are bound to drop soon since they have been rising for a long time now.
- 12 It must be a good school – the fees are so high.
- 13 I'm not doing maths homework today because I need to work on my history.
- 14 Female office workers work just as hard as male office workers and are just as productive. Therefore female office workers doing the same job as men should receive the same pay.

- 15 Marijuana should be legalised because it is no more dangerous than alcohol, and less dangerous than tobacco, both of which are already legal.
- 16 Marijuana should not be legalised because it leads to the use of harder drugs such as heroin.

A little more about being careful in arguments: definitions

You may have participated in, or listened to, an argument which seems to go around and around in circles, with neither side able to progress towards a conclusion. This is sometimes inevitable – agreement on certain topics may never happen. But sometimes arguments are particularly frustrating because one or both sides seem unable to see what the other is saying. This can sometimes be due to problems relating to the language we use and, in particular, to problems relating to *meaning* and *definition* (in Chapter 12 we shall see that *meaning* is a very complex and subtle concept; for now we take it at face value).

You have already seen that if we attempt to define terms such as 'art' or 'life' or 'science', then what initially seemed obvious becomes fraught with confusion and ambiguity very quickly. It's not so much that we don't know what we mean when we use these terms, but pinning them down precisely can be difficult, and often other people will hold to slightly different definitions.

Even if we pick a very precisely defined word, we can see that difficulties arise. A 'bachelor' is defined as an adult human male who has never been married. It seems clear enough, but now ask yourself if these people are bachelors.

- Anthony is seventeen years old. He attends school and lives with his parents.
- Bertrand is seventeen years old. He left home at fourteen to start his own company and is now a millionaire. When not abroad attending business meetings, he lives in his own house and has a playboy lifestyle.
- Charlie and Chris are homosexual lovers who have been together happily for twenty years.
- David has been living with Daphne for the last ten years. They have three children. He has never been married, and has no intention of ever getting married.
- Edward is married to a woman who paid him \$25,000 so that she could become a citizen of his country. He has met her once, and they have never lived together. They will divorce as soon as it is possible for the woman to retain citizenship. Meanwhile, Edward is seeing other women.
- Father Francis is a Catholic priest.

If you were to argue about any of these, then it would be clear that your argument has nothing to do with the facts of the situation. If I think that David is a bachelor but you don't, then there are no new pieces of information that would help solve the problem. It would be fair to characterise our disagreement as being more about the word 'bachelor' than about David's status.

This sort of disagreement can happen frequently unless we are careful. Most often it happens when terms are vague or emotionally loaded, but it can happen with seemingly 'well-defined' terms like 'bachelor'. We might therefore distinguish between two different types of disagreement:

- 1 **The factual dispute.** If I think that Singapore is south of the equator, and you maintain that it is just north of the equator, then our disagreement is easily resolved by reference to an atlas. We almost certainly agree on the meanings of 'Singapore' and 'equator' and we have a genuine disagreement.
- 2 **The merely verbal dispute.** This is where the presence of an ambiguous term conceals the fact that there is no real disagreement. Disputes like these are not always easy to spot, but once we recognise them we can usually resolve the problem by clearing up the ambiguity. As shown in the bachelor example, the ambiguity can arise even with words in common use.

Notice that it is quite possible for both of these types of dispute to be present in an argument! If two people are arguing about a film with explicit sex/violence in it, then there may be a disagreement of type 2 over the term 'explicit' and/or differences of type 1 about whether or not children should see these films (whatever the meaning of the word 'explicit').

A What sort of disputes are these? If merely verbal, resolve the dispute by explaining the ambiguity.

- 1 **A:** Dave is the best tennis player in the club. His serve is faster than anyone else's.
B: No, Nick is much better! His volleying is amazing.
- 2 **A:** I read in their annual report that General Industrial's earnings have increased again this year.
B: No they haven't. They may say that they have, but they are currently being investigated for false reporting. Their earnings are actually lower.
- 3 **A:** National Conglomerate are doing well. Their sales so far this year are 15 per cent up on last year.
B: No, they aren't doing very well. Profits so far this year are 30 per cent lower than they were this time last year.
- 4 **A:** Jenny is a great student. Although her assignments are always late, she always asks perceptive and intelligent questions in class.
B: Jenny is one of the worst students I've ever met. Her smart answers in class don't make up for never getting assignments in on time.
- 5 **A:** Even though they are several hundred years old, Shakespeare's plays are enormously relevant. Love, death, duty, sacrifice and honour ... these themes are as important today as they were when the plays were written.
B: I don't agree. What does Shakespeare have to say about over-population, environmental degradation and unemployment? Nothing. His plays are irrelevant today.
- 6 **A:** Alice finally got rid of that old computer of hers and bought herself a new one. She uses a Mac now.
B: No, Alice didn't buy herself a new computer. That Mac is a good three years old. →

- 7 **A:** Jim finally got rid of that old computer of his and bought himself a new one. He's using a Mac now.
B: No, Jim didn't buy himself a new computer. It's his roommate's new Mac that he's using.
- 8 **A:** George lives a long way from here. I walked out to see him the other day, and it took me nearly two hours to get there.
B: No, he doesn't live such a long way from campus. I drove over there and we reached his place in less than ten minutes.
- 9 **A:** It was in very bad taste to serve roast pork at the banquet. There were Muslims present, and it is against their religion to eat pork.
B: Bad taste! No way! That was the tastiest meal I've had in a long time. Lovely!
- 10 **A:** Our daughter is a wonderful mother to our grandchildren. She lets them want for nothing; they have a beautiful home, wonderful toys and are sent to a fantastic school.
B: I don't think she is a good mother at all. She is so busy working that her children hardly know her. They know their childminders better; she is just someone who pays the bills.
- 11 **A:** A tree falling in a wilderness with nobody around to hear will produce no sound. There can be no auditory sensation unless someone actually senses it.
B: No, whether anyone is there to hear it or not, the crash of a falling tree will set up vibrations in the air and will therefore produce a sound in any event.
- 12 **A:** Mr Zebedee is a real Christian. He's such a nice guy and is always helping out in community projects.
B: I wouldn't call Zebedee a Christian. He only goes to church at Christmas.
- 13 **A:** Don't ask your wife about it. You should use your own judgement.
B: I will use my own judgement, and in my judgement, I should ask my wife.
- 14 **A:** Tom committed the murder of his own free will. Nobody told him, made him, or even suggested to him that he should do it. It was his own freely made decision.
B: That is impossible. Either it was something in his nature that made him do it, or something in the environment, or maybe some combination. And Tom is not responsible for his own nature (that's his parents' genes) nor his environment (that's society). So he has no free will.
- 15 **A:** Professor Dogsbreath is one of the most productive scholars here. He has written more than any other staff member.
B: He's not productive! He may have written a lot, but none of it is original or interesting. He is actually completely unproductive.
- 16 **A:** Unemployment here is only one million according to government statistics.
B: Oh no, there are far more people unemployed! The President's Economic Report states that there are 35 million employed in this country, and the Census Bureau reports a total population of over 55 million. So the government's figures reveal that there are over 20 million unemployed persons in this country.
- 17 **A:** That man just broke the law by driving like that.
B: No he didn't – that was perfectly legal.

- B** From the local newspaper, identify three disagreements in current political or social controversy that exhibit the features described in this section.

Common fallacies and errors of reasoning

So far we have looked at the rules for getting an argument right, but in practice they are often broken. When an argument is not valid, we say that it is 'fallacious'. A **fallacy** is an argument which, however appealing it may be, is not logically valid. There are a great many reasons why an argument may seem convincing when it should not. Here are some examples of the most common ones.

- A** Make sure you understand the principle behind each fallacy listed below and write a definition as to what each one means.
B Find some examples of fallacies in everyday conversation and in the editorials and adverts of newspapers.

- Ad misericordiam
- We hope you'll accept our recommendations. We spent the last twelve weeks working extra time on them and we are quite exhausted.
- Please give me a good assessment – my parents will be furious if you don't!
- You *always* win these arguments we have. Can't you let me win just this one?
- Ad hominem
- You may argue that God doesn't exist, but that's just because you are so bigoted.
- Jim's argument about his ex-wife should be ignored because he is very bitter towards her.
- You claim that Tim is innocent, but why should we listen to you? You are a criminal, too.
- Hasty generalisation
- Fred the Australian stole my wallet. All Australians are thieves.
- Six of my friends like the new school uniform – it will be really popular.
- All the new-born babies I've seen are so cute! Our child is going to be absolutely adorable!
- Appeal to authority
- One of the world's top economists states that interest rates will fall soon, so it must be true.
- The Prime Minister says that traditional educational methods are in dire need of reform and he must know what he is talking about as he did make it to be Prime Minister.
- It must be true – our Theory of Knowledge teacher says so!

- Unpalatable consequences
 - Evolution cannot be true because, if it were, then we would be no better than the apes.
 - You must believe in God, otherwise life would have no meaning.
 - I don't believe a nuclear war will happen because I could never sleep at night if I did.
- Loaded language
 - Clear thinkers will agree with me that we should have another free vote on abortion.
 - The Minister *claims* that the new tax rate will benefit the poor.
 - The proposal is likely to be resisted by the bureaucrats in the Government.
- Appeal to common practice
 - Some people say that cheating in tests is wrong, but everyone does it, so it's okay.
 - Political corruption is just a way of life; there's no point in complaining.
 - You shouldn't pick on me for not doing my homework when others haven't done it either.
- Red herring
 - Air bags in cars do not really increase safety, and besides, most cars with air bags are Japanese.
 - Women should be able to decide about abortion – men getting involved is just another example of the long history of male oppression of women.
 - This may be a meat-importing company, but I happen to like the taste of red herrings.
- Straw man
 - I can't understand anyone wanting to cut military expenditure. Why would anyone want to leave our country defenceless?
 - Evolutionists say that life came about by chance – how ridiculous!
 - To be anti-abortion is wrong since pro-lifers believe a woman should bring her fetus to term even if it means she dies in the process.
- False dilemma
 - Either you're for me or against me.
 - America: love it or leave it.
 - Either we cut welfare benefits or we raise income tax: that is the choice we face.
- Ad ignorantiam
 - You can't explain where God is, so God doesn't exist.
 - Scientists have not proven that global warming will occur, so let's not worry about it.
 - God must exist because it is impossible to prove that he doesn't.

- Ad bacculam
 - You had better agree that the new policy is a good one if you expect to keep your job.
 - The defendant is innocent because, if he isn't, there will be a very violent riot.
 - If you don't turn to religion you will face eternal damnation.
- Contradiction in terms
 - There are no absolutely true statements.
 - It is impossible for written words to communicate anything.
 - I do not exist.
- Begging the question, or circular arguments
 - Whatever is denser than water will sink, because such objects cannot float.
 - God exists because the Bible says that he does; and the Bible is God's own truth.
 - The stock market fell yesterday due to profit-taking by investors.
- False cause, or post hoc ergo propter hoc
 - Smokers get bad grades; to improve yours you had better give up!
 - College-educated people earn more money than those who haven't been to college; if I want to earn a lot of money I had better get a good education!
 - Both times I have had a car accident I was wearing that shirt. I'll never wear it again.

Vertical and lateral thinking

We have seen that valid logic allows us to construct a chain of reasoning that can extend our knowledge. In some cases, notably mathematics and science, logic allows us to construct incredibly long and complex chains of reasoning. These chains can bring surprising results from 'obvious' premises and the deduction of new knowledge. So the role of logic in deriving knowledge is clear. We are aware of the problems that we may encounter (they are largely the subject of this chapter) but, even so, we can use the methods of logic in a straightforward way. Or can we?

Sometimes logic does not help us find what we want to know, and there are many puzzles which make entertaining use of this fact. Try this problem: a man went to a party and drank some of the punch. He then left early. Everyone else at the party who drank the punch subsequently died of poisoning. Why did the man not die (he did not put the poison in the punch himself!)?

It is interesting that the answer to this problem is logical and yet quite difficult to see. There are no random or bizarre events going on – this is a straightforward application of reasoning. So why is it difficult? Why is the solution (that the poison in the punch came from the ice cubes, so when the man drank the punch the ice was fully frozen, but gradually it melted, poisoning the punch) far from obvious?

- A** Think of some other problems where the solution seemed very difficult, but was 'obvious' once you knew it.
B Explain why a solution can be both difficult and obvious.

There is a useful metaphor here, which was put forward by the writer Edward de Bono. He described logic as the tool that is used to dig holes deeper and bigger, but he pointed out that, if a hole is in the wrong place, then no amount of digging will get you to your intended destination. He argues that sometimes logic simply isn't enough and you need to think again – that is, you need to dig your hole elsewhere. This process of digging elsewhere, of abandoning the familiar and 'obvious' ways of thinking, has been called 'lateral thinking'. Lateral thinking describes a way of thinking that is supposed to be less constrained and more creative than 'normal' logical thinking. However, we have already looked at 'normal' logical thinking in enough detail to understand that lateral thinking may not be so completely different after all.

- A** What are the problems associated with 'hidden assumptions' in regular thinking? Why do we make these assumptions?
B Would it usually be desirable to make no assumptions at all?
C How does lateral thinking fit into this way of analysing the issue?

The concept of lateral thinking is a useful way of alerting us to all the things that we assume without realising that we have assumed them. In this respect, it is a crucial part of any form of critical analysis. But this also means that there is not much else that can be said – if there was a formula or a sure-fire method for identifying hidden assumptions then they would not be so hidden, and lateral thinking would be less lateral and more straightforward!

- A** Explain this: a man walks into a bar and asks the barman for a glass of water. The barman pulls out a gun and points it at the man. The man says 'thank you' and walks out.

Is there more to rationalism than logic?

...thinking that is
practical and
particular, not
vacuous and
formal...

David Weissman

We started the chapter with what has been seen as a very attractive idea: the possibility of certainty (and perhaps even truth) in the form of deductive logic. This logical approach is one that has been adopted (sometimes implicitly) in many areas of human endeavour, and with apparently great success in many of them. But as the chapter progressed and we moved from the clean application of logical principles in the abstract to real-life examples we saw that there are some profound problems with logical analysis and that it may not be as powerful a tool as we had hoped.

This is a recurring theme in a great deal of modern thinking, and it's interesting to see why some thinkers claim that we need to re-think the uses of reason, and in particular to temper the

hard-nosed approach of logic. One of the main thrusts of their argument is that logic has traditionally been seen as the academic's way of repairing the cognitive errors of the stupid; a way for 'intellectuals' to get one over on the 'common' man or woman. So logic might be presented (indeed, *has been* presented by some philosophers) as a way to attack common-sense judgements for their superficiality, incoherence and general inadequacy.

Of course this sort of approach leaves the philosophers open to the charge that logic actually adds nothing to what everybody already knows, and that it does not, in fact, help anyone make decisions any better. If my granny at home has managed to do perfectly well just as she is, ignorant by any standard of logic, then she really doesn't need logic to inform her thinking or help her make judgements in her life. Logic is then just playing with words to no good effect.

- A** Is there a clear distinction between logical reasoning and 'everyday' 'common' thinking? If so, is the former superior to the latter?
B Is the philosophical study of reason, as, for example, we have seen in this chapter, rather a pointless, ivory-towers exercise, or might it in any way inform your everyday thinking?
C Do you think it would be a good thing for everyone to understand the ideas that we have looked at in this chapter?

The criticisms of logical analysis have in some cases come from philosophers who argue that if we want to understand how knowledge is made and judgements are justified, then armchair thinking is not enough. They claim it needs to be complemented by a willingness to take a close look at how people in their various activities actually do such things, quite efficiently and to their general satisfaction. And it is certainly true that extremely skilled people like engineers, nurses, cooks, drivers, surgeons, and in fact most people, are not very much interested in metaphysical concepts such as reason, logic, induction and validity. Thomas D'Evelyn puts it rather strongly: '*research universities may resemble madhouses, each researcher locked in his dream of reason, incapable of addressing the needs of others or of society at large*'.

If these thinkers are correct then we need to broaden our concept of reasoning to include more than just logic. Philosopher Stephen Toulmin argues for a concept of 'reasonableness' which he bases on the model of the skilled craftsman's 'knack' – the instinctive knowledge that musicians, teachers, engineers and athletes show in their everyday practice. He argues that we recognise that knack is rooted in non-verbal knowledge, and perhaps cannot be reduced to strings of clinically articulated logical arguments, suggesting that the current 'obsession' with logic is a passing fad. He notes that civilisations have historically valued reasonableness; he cites, for example, the Chinese sage Chuang-Tzu, who tells of a cook whose dimensionless blade effortlessly and perfectly separates bone from meat. The cook

'tries to use what cannot be measured in an entirely practical way', and it is this emphasis on the practical that is most important. What is the point of a philosophical system such as rationalism, Toulmin asks, if it cannot effectively guide practice in such a concrete, contingent and complex world?

- A** Are these concepts of 'knack' or 'reasonableness' useful? Are there things that you know that cannot be described logically?
- B** Is Toulmin right that logic cannot 'adequately instruct... how to sail this particular boat, fire this particular cannon, or roast this particular chicken'?
- C** Tim Sprod has suggested that we are faced with two alternatives:
 - rationality is something like deductive logic + inductive logic + informal logic and, as emotional humans, we are never completely rational in our decisions
 - we need to expand the notion of rationality (and maybe like Toulmin call it reasonableness) to embrace all those ways in which humans use their mental capacities to draw useful or even true conclusions.

Is he right that these are the two options, and if so, what are the advantages and disadvantages of each?

Toulmin's thesis is quite appealing to some, but others think he has gone too far. Against Toulmin we might argue that logic may be abstract, but it is the very abstraction that means it is useful, because it means that one generalisation can be used to guide us in many different circumstances. Logic is like science in this respect – we seek general principles to guide us, but we recognise that the principles are, strictly speaking, wrong because they are idealised abstractions from our experiences.

- A** Could we get by without abstract theories to guide us?
- B** Toulmin writes that mathematical proofs 'have no direct contact with the World of Real Things', and that abstract theories that apply always and everywhere 'hold good nowhere-in-particular'. Is he right?

Where do we go from here?

We turned to rationalism hoping to generalise the mathematical method. Did we succeed? Well, only partly. We have seen that it is often possible to construct compelling arguments, but only when we are certain about the starting points, or premises, and that this certainty is difficult to find for a number of reasons, not least the problems of meaning in the words we use. (We should also mention that we have not really inquired too closely into exactly *why* a valid argument is compelling – this would take us a little too far afield and into the specialist area of logic.)

In the introduction to this chapter, we asked if using the approach of rationalism was 'correct'. We have seen that it has its strengths and weaknesses, but we will leave a full answer to that question until we have considered the concept of paradigms in Chapter 11, by which time we will be in a better position to see the complete picture.

In dealing with the abstract and perhaps remote worlds of maths and logic it may have emerged that we cannot, as humans, really study these without recourse to the non-rational side of our minds, and just as we turned to the arts to balance the natural sciences, so we can now turn to the emotions to see what they can add to our search of reliable knowledge.

Further reading

The best introduction to informal fallacies that I have come across is *Bad Thoughts* (Corvo, 2003) by Jamie Whyte – delightfully readable and based in interesting and current examples. A sparkling, accessible but at the same time profound approach to reasoning and the possibility of paradox can be found in Raymond Smullyan's brilliant *What is the Name of this Book?* (Prentice Hall, 1978); informative though probably overrated is Edward de Bono's classic *Lateral Thinking* (Ward Lock Education, 1970). More analytic approaches to the use of reason in general can be found in A. J. Ayer's *The Problem of Knowledge* (Open University Press, 1956) and Bertrand Russell's *The Problems of Philosophy* (repr. Oxford University Press, 1998). There are quite a few books around that question the whole nature of the rationalist project; they are generally difficult, but I would recommend two of Michael Oakeshott's essays – 'The Tower of Babel' and 'The Voice of Poetry in the Conversation of Mankind', both of which can be found in *Rationalism in Politics and Other Essays* (Methuen, 1962). Also recommended is Julian Baggini's 'Philosophy as Judgement' in *What Philosophy Is*, ed. H. Carel and D. Gamez (Continuum Press, 2004). Stephen Toulmin's *Return to Reason* (Harvard University Press, 2001) is a call for abandoning the rational project and broadening our conception of rationalism; and for a superb case study of such a conception in the medical profession I recommend *Complications* by Atul Gawande (Profile Books, 2003) – it is a magnificent set of reflections on the role of reason in medicine.

Resource file

Some more about the laws of logic...

You have probably come across arguments such as these:

therefore: **A** All humans are mortal
B I am human
C I am mortal.

or

therefore: **A** Elvis is either dead or alive
B Elvis is not alive
C Elvis is dead.

The commentary that usually goes with these suggests that they are *valid* arguments. That is, it is usually argued that, if A and B are true, then C must be true too. The two important words are *if* (because logic says nothing about the truth of the premises) and *must* (because logic appears to be absolutely certain). And if you agree with this then that's just great for you – you have a powerful tool to use in your search for truth.

But what if I do not agree that that these are valid arguments? Suppose I, a skeptic, concede that A and B are true, but think that C is false. How could you, a believer, convince me that C *must* be true? We can imagine a rather frustrating conversation.

Believer: Are you seriously saying that you agree that (A) All humans are mortal, and (B) I am human, but do not agree that it *must* then be true that (C) I am mortal?

Skeptic: Yes.

Believer: But that's idiotic! Do you really think that I am immortal?

Skeptic: Of course not – that's not what I am suggesting at all. I am just saying that even though A and B are true, C still *could* be false – you still *could* be immortal. I know that you aren't, as you are just like the rest of us, but I maintain that even though A and B are true, it does not mean that you *must* be mortal.

Believer: OK so we agree that I am mortal – but what you say still doesn't make any sense. How can you deny that I have to be mortal? All humans are mortal, I am a human ...

Skeptic: Yes we agree on this.

Believer: ... and so I *must* be mortal. It simply *must* be true!

Skeptic: Why? I don't see it.

Believer: Well, when we say *all* humans are mortal, then I come under the *all* bit – that's what it means when we use the words like this.

Skeptic: I understand the words, I just do not see the logic. It seems to me that it is perfectly possible for A and B to be true, but for C to be false.

Believer: How?

Skeptic: Easy – it would be true that (A) All humans are mortal (B) I am a human and also true that (C) I am immortal.

Believer: But that's impossible!

Skeptic: Why? All you are doing is showing a lack of imagination.

Believer: I can show you a thousand people who would agree with me! Would that convince you?

Skeptic: Are you really saying that the so called laws of logic are decided democratically? What happens if those thousand people change their mind? In any case, it is not hard to think of cases where a lot of people believe something which has turned out to be false. Public opinion is hardly an argument – can you find no better way to persuade me?

Believer: All I am saying is that some things are so obvious that they need no reasons and this is one of those things.

Skeptic: What may be obvious to you may not be so obvious to everyone else.

This conversation could go on for a long time, but you can see that, to whatever the believer says, the skeptic can just disagree. And irritating though it is, if the skeptic really cannot see the validity of the argument (it is valid isn't it?) and the believer cannot provide a good reason, then isn't the skeptic right to doubt the validity of the argument?

A Do you think the argument under debate is a valid argument? If so, why? If not, why not?

B How would you convince the skeptic that the argument is valid?

C How would you persuade the believer to doubt the validity of the argument?

D Can you see why many philosophers have thought that there is such a close link between logic and language?

Essentially the skeptic and the believer are arguing about what is 'obvious', but ironically, it seems to be that what is 'obvious' is far from obvious. Many philosophers have shared the skeptic's distrust of the fact that nearly everyone seems to find an argument valid, and looked for a way to base arguments on laws that don't just seem right, but that it is impossible to dispute without talking nonsense. They have traditionally started with far more basic things than the one we have so far discussed, and if you look up 'Laws of Logic' in a dictionary of philosophy then you will find three laws. Here are the first two:

- 1 The law of *identity*: A thing is what it is. For example, a book is a book and a leaf is a leaf.
- 2 The law of *non-contradiction*: A statement cannot be both true and false at the same time. For example, if it is true that I always tell the truth, it cannot be true that I am a liar, and if I am dead then I cannot be alive.

Many people think that these are almost too obvious to state – but bearing in mind the skeptic's words above, perhaps this is no bad thing. And if you are worried that these statements are simplistic, you are right – that is why they are axioms and not deductive results.

So the natural question to ask is 'Are these obvious and undeniable?' Could even the skeptic still refuse to believe them? Let's consider the first law:

Skeptic: I refuse to accept the law of identity. I can't see why it has to be true.

Believer: You call that a refusal do you?

Skeptic: I do.

Believer: Well then, in admitting that your refusal is a refusal, you have used the law of identity haven't you? So you must think it is true after all.

Skeptic: Err... well, then it is not a refusal.

Believer: Then you have no refusal. So you do not refuse to accept it, and so you must think it is true after all.

Skeptic: Well, I still deny it.

Believer: But now you are really making no sense at all.

Skeptic: Maybe not to you, but I make perfect sense to me.

A Make up a dialogue between the skeptic and the believer where they debate the second law.

B Explain in your own words the position of the skeptic. Why does he not accept the laws?

C Is the skeptic's position a reasonable one? That is, do you think it is possible to reasonably deny the two laws of logic given?

There is a third law of logic, but it is not so universally accepted:

3 The law of the excluded middle: A statement is either true or false (that is, there is no middle ground between true and false). So, for example, it is either true or false that I am alive, and it is either true or false that I am holding a book.

It has been suggested that there are two other possibilities:

3a There are many other possibilities other than true and false. If true corresponds to the number 'one' and false to 'zero' then these other possibilities refer to numbers between zero and one.

3b In addition to 'true' and 'false' there is one other possibility which is neither true nor false.

A In what subjects that you study might you want to accept either 3, or the modified 3a or 3b? Give some examples, thinking carefully – this is a complex issue (e.g. perhaps surprisingly, there is a branch of mathematics (intuitionism) which holds 3 to be invalid, and uses 3b in its workings).

There has been a great deal of disagreement over laws which are meant to be obvious! And we have not yet begun to look at constructing more complex arguments – so you can see that logical analysis can be a tricky business. To look into this in any more detail would very quickly get very technical and difficult, so perhaps we can end by reiterating two questions that need answering if we are to use logic as a reliable tool.

A What are the 'correct' basic laws of logic?

B Once we have the 'basic' laws, how do we construct more complex ones?